

Operational EEW Networks in Turkey

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There are several EEW networks and algorithms under operation in Turkey. The first EEW system was deployed in Istanbul in 2002 after the 1999 Mw7.4 Kocaeli and Mw7.1 Duzce earthquake events. The system consisted of 10 strong motion stations located as close as possible to the main Marmara Fault line. The system was upgraded by 5 OBS (Ocean Bottom Seismometer) in 2012 located in Marmara Sea. The system works in threshold based algorithm. The alert is given according to exceedance of certain threshold levels of amplitude of ground motion acceleration in certain time interval at least in 3 stations.

Currently, there are two end-users of EEW system in Istanbul. The critical facilities of Istanbul Gas Distribution Company (IGDAS) and Marmaray Tube tunnel receives the EEW information in order to activate their automatic shut-off mechanisms. The IGDAS has their own strong motion network located at their district regulators. After receiving the EEW signal if the threshold values of ground motion parameters are exceeded the gas-flow is cut automatically at the district regulators. The IGDAS has 750 district regulators distributed in Istanbul. At the moment, the 110 of them are instrumented with strong motion accelerometers. As a 2nd stage of the on-going project, the IGDAS company proposes to install strong motion accelerometers to all remaining district regulators. The Marmaray railway tube tunnel is the world's deepest immersed tube tunnel with 60m undersea depth. The tunnel has 1.4km length with 13 segments. The tunnel is monitored with 2 strong motion accelerometers in each segment, 26 in total. Once the EEW signal is received, the monitoring system is activated and the recording ground motion parameters are calculated in real-time. Depending on the exceedance of threshold levels, further actions are taken such as reducing the train speed, stopping the train before entering the tunnel etc.

In Istanbul, there are also on-site EEW system applied in several high-rise buildings. As similar to threshold based algorithm, once the threshold level is exceeded in several strong motion accelerometers installed in the high-rise building, the automated shut-off mechanism is activated in order to prevent secondary damage effects of the earthquakes.

In addition to the threshold based EEW system, the regional EEW algorithms Virtual Seismologist (VS) as implemented in SeisComP3 VS(SC3) and PRESTo have been also implemented in Marmara region of Turkey. These applications use the regional seismic networks. The purpose of the regional EEW systems is to determine the magnitude and location of the event from the P-wave information of the closest 3-4 stations and forward this information to interested sites. The regional EEW systems are also important for Istanbul in order to detect far distance earthquake events and provide alert especially for the high-rise buildings for their long duration shaking.